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TECHNICAL REPORT - SDC 279-1-12

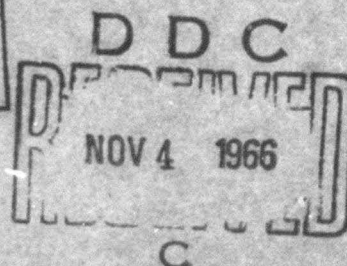
PROBLEMS IN THE FITTING AND SERVICING OF PROSTHETIC DEVICES FOR
ABOVE-THE-KNEE AMPUTEES

(Aeromedical Research)

Research Division, College of
Engineering, New York University
Project 80

Contract N6ONR-279, T.O.I, Amend. 2
Project Designation NR-900002
SDC Project 9-D-1

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SPECIAL DEVICES CENTER
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INTRODUCTION

It is the purpose of this report to compare the responses obtained from the amputee, limb-maker, and surgeon groups which participated in the questionnaire studies dealing with the engineering, psychological, medical, and limb-fitting factors involved in above-the-knee amputation. An attempt is made in this report to assemble the data obtained from amputees (see "Report of the Questionnaire Survey of 128 Above-the-Knee Amputees," Report No. 80.07, Research Division, College of Engineering, New York University, New York, 53, New York); orthopedic surgeons (see "Report of the Questionnaire Survey of 68 Orthopedic Surgeons," Report No. 80.08, Research Division, College of Engineering, New York University, New York, 53, New York); and limb-makers and limb-fitters (see "Report of the Questionnaire Study of 69 Limb-Makers and Limb-Fitters", Report No. 80.09, Research Division, College of Engineering, New York University, New York, 53, New York) in such a manner as to make readily available comparisons of the thinking and proposals presented by each of these groups which are intimately concerned with any attempt at understanding the problems of the above-the-knee amputee.

In handling the material, we have arranged the report in four sections:

Section I - Amputee - Limb-Maker Considerations --

In this section of the report, the responses obtained from amputees and limb-makers are compared, stressing those factors for which data are available from both groups. Additional material is presented which demonstrates the attitude of the amputee toward the limb-making profession as well as the feelings which are exhibited by the limb-maker toward the amputee.

Section II - Amputee - Surgeon Considerations --

This part of the report is organized in the same manner as the section dealing with Amputee - Limb-Maker Considerations. Comparisons are made of responses which are common to both groups, and information is provided concerning the attitudes which are expressed by each group towards the other.

Section III - Surgeon - Limb-Maker Considerations --

This section compares the responses obtained from the surgical and limb-making professions concerning factors on which data were collected from both groups. The question of surgeon - limb-maker cooperation is considered along with a discussion of the attitudes expressed by each group towards the other.

Section IV - Amputee - Limb-Maker - Surgeon Considerations --

This portion of the report considers those factors the data for which were obtained from each of the three groups which contributed to the study. Comparisons are provided concerning the responses obtained from the amputee, the limb-maker, and the surgeon.

All of the data which have been utilized in this report were accumulated independently, and have been made available in separate reports. This paper deals only with that part of the data which provides material suitable for comparisons and, therefore, constitutes only a small phase of the information which was obtained. For more complete reports concerning the data provided by each of the three groups participating in this program of research, consult "Report of the Questionnaire Survey of 128 Above-the-Knee Amputees," Report No. 80.07; "Report of the Questionnaire Survey of 68 Orthopedic Surgeons," Report No. 80.08; and "Report

of the Questionnaire Survey of 69 Limb-Makers and Limb-Fitters," Report No. 80.09, all of which were published by the Research Division, College of Engineering, New York University, New York, 53, New York, in accordance with Task Order No. 1, Amendment No. 2, of Contract N6 ONR-279 between the Navy Department, Special Devices Center, Office of Naval Research and New York University.

Comparative data from the three questionnaire surveys are presented below, and in each case where we have felt justified in making an interpretation of the data, this situation is clearly indicated.

SECTION I - AMPUTEE - LIMB-MAKER CONSIDERATIONS ---

A comparison of the responses of the amputee with those of the limb-makers in describing the chief faults which are asserted to exist in artificial limbs reveals that the amputee is primarily concerned with:

- * 1 - knee control
- 2 - improper fit
- 3 - excessive weight
- 4 - improper alignment

the limb-maker considers:

- 1 - improper fit
- 2 - knee control
- 3 - belt suspension
- 4 - improper alignment

as being the least efficient aspects of present day prostheses. Thus, both groups agree on the relative inadequacy of present fitting techniques, knee control, and alignment of prostheses, but show a difference in emphasis concerning the importance of weight and the use of the belt suspension system.

Regarding suggested improvements for the present types of artificial limbs, we find a greater concentration of responses evidenced by the amputee group. The amputee seeks:

- 1 - better knee control
- 2 - reduction in weight

* Throughout this report, data will be listed in the order of decreasing frequency of response.

- 3 - better belt control
- 4 - elimination of noises
- 5 - greater facilities for servicing

as a means toward improving his prosthetic appliance. The limb-making group, on the other hand, offers a wide range of suggestions concerning improvement of available prostheses, and stresses:

- 1 - more efficient fitting techniques
- 2 - reduction in weight
- 3 - better knee control
- 4 - more careful alignment.

It is interesting to note that although the amputee does not emphasize more efficient fitting of the appliance, this issue is the most common suggestion offered by the limb-making industry.

During the course of conducting an inquiry among limb-makers and limb-fitters, manufacturers of many different types of prostheses were contacted. This fact helps explain the variety of suggestions offered by this group for the improvement of artificial limbs. It is reasonable to assume that each individual cooperating in the research project used the artificial leg developed by his own organization as a frame of reference for his comments about and evaluations of other prosthetic devices.

In explaining why some amputees get better use from their prostheses than others, we found considerable similarity in the thinking of the amputee and limb-making groups. Responses of amputees and limb-makers were alike or similar with respect to the following factors:

- 1 - psychological factors
- 2 - physiological factors

3 - fit differences

4 - practice and training.

Although 97 per cent of the limb-makers participating in this research indicated that information is provided the amputee concerning the difficulties that are commonly experienced, only 43 per cent of the amputee group indicate that they had been told how to overcome the troubles commonly experienced.

Interpretation: This situation introduces the possibility that the limb-maker is not using adequate means for conveying the material to the amputee or suggests that he may offer only descriptive information concerning the troubles encountered with artificial legs without providing suitable suggestions concerning the manner in which these obstacles can be overcome.

Both groups attach great importance to the development of an efficient training program, indicating that this process is of paramount importance in determining the skill with which an amputee can use his prosthesis. The amputee and the limb-maker consider training programs that are in effect today as ineffective, owing to a lack of sufficient time available for the learning experience; however, neither group can offer any concrete suggestions for the development of a more useful training program.

The over-all attitude of the amputee toward the limb-maker shows considerable hostility. Thirty-six per cent of the limb-wearers participating in our study imply that the limb-maker is not adequately trained for his job, and most of the group rate the work of the limb-maker or limb-fitter as being no better than fair.

The attitude of the limb-maker towards the amputee, on the other hand, is a positive one, in which he indicates that the amputee is generally helpful in the execution of his task.

Interpretation: There appears from our data to be a marked need for the limb-making industry to develop its relationships with amputees. The amputee at present doubts the ability of the limb-maker, attacks his policies as being mercenary, and does not consider his skills as operating at their most efficient level. Such discord as evidenced by the amputees' attitude towards the limb-making profession certainly seems to indicate a need for the limb-maker to promote a campaign designed to investigate the cause of the present relationship, if it does truly exist, and also to develop a better understanding between the limb-making and limb-wearing groups. There can be little measure of success if the situation were permitted to continue with misconceptions of the problems involved in prosthetic services by these two groups who must work so closely together.

SECTION II - AMPUTEE - SURGEON CONSIDERATIONS --

The orthopedic surgeons participating in this research indicate that in above-the-knee amputations most patients report some mild pain, but only during the early post-operative stages of healing. This finding, however, is not substantiated by the responses obtained from the amputee group, who report pain in their stump as a result of:

- 1 - walking or wearing the limb for a sustained period of time
- 2 - changes in the weather
- 3 - stump rashes, resulting from irritation caused by the prosthesis.

Interpretation: In light of these data, it is reasonable to suspect that ample opportunity may not often be provided the amputee to consult with the surgeon following the initial period of hospitalization.

Concerning the amputee's major complaints with reference to artificial limbs, the responses from the orthopedic surgeons and the amputees showed a good deal of communality of thinking. Both groups describe knee control, improper fit, and excessive weight as being significant flaws in the prostheses available today. However, the groups do differ in that the amputee stresses improper alignment as constituting another significant deficiency, while the surgeon cites stump pains and irritations. This last difference is easily understood in light of the types of experience afforded to each of the two groups.

With respect to the manner in which artificial limbs can be improved, both groups advocate the development of a better system of knee control and a reduction in the weight of the prosthesis. A difference in the

thinking of the amputee group as compared to the orthopedic surgeon is evidenced, however, by the limb-wearers' further concern over the techniques of limb alignment, while the surgeon seeks wider use of the suction socket as a means for increasing the effectiveness of above-the-knee prosthetic appliances.

In accounting for the reasons why some amputees get poorer use from their prosthesis than others, both groups agree that differences in psychological structure, physiological makeup, and fit are the basic determining factors. It is of further interest that almost one of every two orthopedic surgeons who responded to this item of the questionnaire (46 per cent of the responses) stressed individual psychological differences as those that account for variations in performance with prostheses.

We generally find the attitude of the orthopedic surgeon towards the limb-making and limb-fitting industry to be much less hostile than the feelings expressed by the amputee group. While only 24 per cent of the limb-wearers considered their present prosthesis as being good or excellent, 60 per cent of the surgeons regard the limbs that are usually available to the above-the-knee amputee in this manner. Further evidence for more positive feelings on the part of the orthopedic surgeon is found in his evaluations of the work of the limb-maker. Here we find that 70 per cent of the surgeons group consider the limb-maker and limb-fitter as doing a good or very competent job; only 56 per cent of the amputees, however, regard the work of the limb-maker as being of such quality.

The orthopedic surgeons agree with amputees and limb-makers in regarding training as being of paramount importance in the efficient use of an artificial limb. However, the surgeons offer no agreement as to what the essential ingredients of a training program should be.

Interpretation: Thus, from the data provided by questionnaire surveys of limb-makers, amputees, and orthopedic surgeons, there can be little doubt that the training program is a vital phase in the over-all process of efficient application and adjustment to a prosthesis; however, it is a phase about which relatively little is known. The question of training could well be the subject for a separate program of research.

Ninety per cent of the responses obtained from the amputee group classify the work of the orthopedic surgeons as having "done their best" or "tried honestly." This attitude contrasts sharply with the feelings expressed by the amputee towards the limb-making group.

Interpretation: One possible explanation concerning the direction of the amputee's hostility may be in the social status of the medical profession in our culture. The prestige of the surgeon greatly overshadows the position of the limb-maker or limb-fitter, and in expressing hostility, the amputee would find it less threatening to direct his aggression at the limb-making group whose social status is less well established than that of the orthopedic surgeons.

SECTION III - SURGEON - LIMB-MAKER CONSIDERATIONS --

In evaluating the artificial limbs that are available to the amputee today, we find little difference in the responses of the orthopedic surgeons as compared to those obtained from the limb-making profession. A majority of both groups considered the available prostheses as being either good or excellent, while only a small percentage of the respondents regarded the limbs as being either poor or very poor.

Only slight differences in the thinking between the two groups are noted concerning the amputee's major complaints with reference to his limb. The orthopedic surgeon describes as being the chief flaws in the limb about which the limb-wearer complains:

- 1 - improper fit
- 2 - stump pains and irritations, and
- 3 - excess weight.

The respondents from the limb-making profession stress:

- 1 - excess weight
- 2 - improper fit, and
- 3 - faulty knee mechanics.

One can account for the slightly different emphasis obtained from each of the groups in this area on the basis of the interest of the orthopedic surgeon as compared to that of the limb-maker, and the type of experience that each group is afforded in its contacts with the amputee.

In describing changes as a means of improving the present artificial leg, there are significant variations in the suggestions offered by the limb-making group as compared to the responses obtained from the representatives of the profession of orthopedic surgery. The surgeon advocates

the following measures for improving the present artificial leg:

- 1 - decrease in weight
- 2 - improvement of the knee joint
- 3 - use of the suction socket.

The limb-makers and the limb-fitters, on the other hand, suggest:

- 1 - decrease in weight
- 2 - more careful alignment
- 3 - more individualized, personal service, and
- 4 - improvement of the knee joint

in order to increase the effectiveness of present-day prostheses.

The most important consideration in the area of limb-maker - orthopedic surgeon relations is the problem of cooperation. An attempt was made, in the research surveys, to evaluate the kinds of cooperation prevailing between these two groups at present, and to obtain the thinking of each of the professions concerning the role which it can play in assisting the other. Concerning the question as to whether the limb-maker should be consulted by the surgeon prior to the amputation, 38 per cent of the surgeons responding advocated the practice as a beneficial opportunity for the mutual exchange of knowledge and experience. Thirty-four per cent of the limb-makers cooperating in the research favored pre-amputation consultation with the surgeon, but 43 per cent of the group advocated consultation only in doubtful cases. Less than one-half of the groups representing the limb-making and surgical professions recommended consultation as a regular procedure prior to amputation.

Regarding the services which the surgeon can render to the limb-maker in order to simplify the problems of prosthetic fit and fabrication,

42 per cent of the orthopedic surgeons suggest close cooperation through discussion, a process which would permit an exchange of ideas, techniques, and information. The most common responses from the limb-making profession, on the other hand, cite only the need for medical services which would provide the most efficient type of surgery and post-operative healing. Only 27 per cent of the limb-makers and limb-fitters consider cooperation and consultation as being an effective service which the surgeon can offer to them.

Interpretation: Although neither group shows as keen a regard for consultation practices as might provide for an effective program of professional cooperation, the representative surgeons are more interested in closer cooperation than the members of the limb-making profession who participated in the research. There seems to be an over-all need, on the part of both groups, to develop a program of close cooperation which would permit the surgeon and the limb-maker to pool their resources in order to provide the amputee with the most efficient services in the areas of amputation and prosthetic fit. This would permit an incorporation of the services which the amputee should receive into a unified program which would provide the most suitable consideration for the limb-wearer. The techniques of limb-fitting are closely related to the physiology of the post-operative stump, and it is only logical that these two inter-related and inter-dependent processes should proceed in close harmony with one another. The common concept which demands that the surgeon save as much of the leg as possible would be superseded by a new formula which calls for the preparation of the stump in order to fit effectively the most suitable prosthesis.

The attitude of the surgeon towards the limb-maker is exemplified by the respondents from this profession who consider only 12 per cent of the limb-makers as being qualified to fit a prosthesis without medical supervision. Eighty-eight per cent of the surgical profession cooperating in our study recommend that at least general surgical supervision be enforced in all cases of limb-fitting.

Interpretation: This type of expressed attitude merely serves to provide another indication of the thinking exhibited by both groups, each of whom seeks the dominant position of supervisor over the other's activity, rather than the role of one engaged in a reciprocal alliance calling for aid and cooperation.

Both the limb-maker and the orthopedic surgeon consider an adequate program of training as being of paramount importance in determining the level of achievement which the amputee will achieve in the use of his artificial limb. However, neither group offers any significant suggestions concerning the organization of an efficient training program. There are apparently little reliable data available at this time which deal with the techniques for prosthetic training.

It is interesting to note the almost perfect agreement between the limb-maker and the orthopedic surgeon in accounting for the reasons why some amputees get better use from their prosthesis than others. Both groups recognize:

- 1 - individual psychological differences
- 2 - differences in physiological status, and
- 3 - differences in fit of prosthesis

as being the key factors which operate in determining the manner in which an amputee will be able to use his appliance.

SECTION IV - AMPUTEE - SURGEON - LIMB-MAKER --

The data which were made available as a result of the questionnaire surveys conducted by the Research Division, College of Engineering, New York University, New York, 53, New York, make it possible to develop direct comparisons among the responses obtained from the amputee, the limb-maker, and the orthopedic surgeon in a number of areas.

All three groups offered information concerning the limb-wearer's major complaints with reference to his artificial leg, and these varied from group to group in accordance with the interests of the group and the type of contacts which its members experience in working with prosthetic appliances and amputees. In comparing the data, we find that each group emphasizes different areas in citing the chief complaints of the amputee:

| <u>the amputee group</u> | <u>the orthopedic surgeon</u> | <u>the limb-maker</u> |
|--------------------------|---------------------------------|-----------------------|
| 1 - knee control | 1 - improper fit | 1 - improper fit |
| 2 - excess weight | 2 - excess weight | 2 - knee control |
| 3 - improper fit | 3 - stump pains and irritations | 3 - belt control |

Only improper fit is listed by all of the three responding groups, while excess weight and faulty knee control are indicated by two of the three groups studied.

Interpretation: In the fact that the limb-maker and orthopedic surgeon are not in agreement with the amputee is a suggestion that there is incomplete understanding on the part of the two professions concerning the problems of the limb-wearer; that the limb-maker and orthopedic surgeon disagree with each other is an indication that these two groups are not working from the same point of view, and are approaching the problem

from different interests. Such different orientations to a given situation is a desirable relationship, but only if the various points of origin eventually come together at a common focal point.

Concerning the question of improvements in the present artificial leg, we find greater agreement in the thinking of the three groups. The data tabulate as follows:

| <u>Amputee</u> | <u>Orthopedic Surgeon</u> | <u>Limb-Maker</u> |
|-----------------------|-------------------------------|----------------------|
| 1 - better knee | 1 - less weight | 1 - less weight |
| 2 - less weight | 2 - better knee | 2 - better knee |
| 3 - better foot joint | 3 - use of the suction socket | 3 - better alignment |

All three groups are consistent in their feelings that a reduction in the weight of the prosthesis and improvement of the knee mechanics in the direction of greater control would be effective measures for making the artificial limb a more efficient device.

The area which demonstrates a marked community of thinking on the part of the amputee, the limb-maker, and the orthopedic surgeon is found in response to the question of why some amputees get better use from their prostheses than others. Here we find that all of the three groups participating in our research stress the following three factors, and in the same order of importance:

- 1 - individual psychological differences
- 2 - individual physiological differences
- 3 - differences in fit of prosthesis.

The only other problem for which we can draw direct comparisons concerning the responses of the three participating groups deals with the matter of training to use a prosthesis. For the amputee, the limb-maker,

and the orthopedic surgeon, formal training is regarded as being a vital phase of the process of learning to use a prosthesis efficiently, and one about which little information is offered, and for which practically no significant suggestions can be provided at this time.

This study represents only a simple and rather small beginning to the entire problem of organizing and pooling the thinking of the amputee, the limb-maker, and the orthopedic surgeon. It is evident, however, from the little evidence that we have assembled, that there is an immediate need for further studies of the type of thinking and activities which prevail in each of these groups which are so intimately concerned with the processes of amputation and limb-fitting.

Interpretation: There have been trends in our data which indicate that the amputee, the limb-maker, and the orthopedic surgeon have been acting independently on this problem, and that each has not coordinated his services with the other in an over-all attempt to provide the greatest good for the greatest number. If this research has done nothing more than to point out the need for closer cooperation among the individuals surveyed, then we may regard it as having made a realistic and significant contribution to the problems involved in prosthetic services.

COMPARATIVE DATASECTION I - AMPUTEE - LIMB-MAKER --

WHAT IS WRONG WITH YOUR ARTIFICIAL LEG? (Amputee)

WHAT DO YOU THINK ARE THE CHIEF FAULTS WHICH EXIST IN THE TYPES OF
ARTIFICIAL LIMBS THAT ARE AVAILABLE TODAY? (Limb-Maker)

| | <u>Amputees</u> | <u>Limb-Makers</u> |
|--------------------|-----------------|--------------------|
| Knee control | 25% | 16% |
| Improper fit | 17% | 18% |
| Improper alignment | 13% | 10% |
| Excess weight | 17% | 5% |
| Belt control | 6% | 14% |
| Noise | 8% | |
| Miscellaneous | 14% | |

THEY COULD IMPROVE MY ARTIFICIAL LEG BY - - - (Amputee)

WHAT CHANGES CAN YOU SUGGEST FOR IMPROVING THE PRESENT ARTIFICIAL LEG?
(Limb-Maker)

| | <u>Amputees</u> | <u>Limb-Makers</u> |
|-----------------------------------|-----------------|--------------------|
| Better knee control | 33% | 9% |
| Reduction in weight | 22% | 14% |
| Eliminate noises | 10% | |
| Better belt control | 11% | |
| Better maintenance | 10% | |
| More careful alignment | | 9% |
| More efficient fitting techniques | | 16% |

WHY DO OTHER AMPUTEES GET POORER USE OUT OF THEIR LEG THAN YOU DO?

(Amputee)

WHY DO YOU THINK SOME AMPUTEES GET BETTER USE FROM THEIR PROSTHESIS
THAN OTHERS? (Limb-Maker)

| | <u>Amputees</u> | <u>Limb-Makers</u> |
|-----------------------|-----------------|--------------------|
| Psychological factors | 29% | 43% |
| Physiological factors | 22% | 24% |
| Fit differences | 20% | 18% |
| Practice and training | 16% | 7% |

DO YOU KNOW WHAT TROUBLES ARE TO BE EXPECTED WITH WEARING AN ARTIFICIAL
LEG? HAVE THEY TOLD YOU HOW TO OVERCOME THEM? (Amputee)

DO YOU PROVIDE THE AMPUTEE WITH INFORMATION CONCERNING THE DIFFICULTIES
AND LIMITATIONS TO BE ENCOUNTERED IN WEARING AN ARTIFICIAL LIMB?

(Limb-Maker)

| | |
|----------------------------|---------|
| Know what to expect | 80% Yes |
| | 17% No |
| Told how to overcome | 43% Yes |
| | 35% No |
| Do you provide information | 97% Yes |
| | 3% No |

SECTION II - AMPUTEE - SURGEON --

I HAVE PAIN WHEN I - - - (Amputee)

HOW FREQUENTLY DO YOUR PATIENTS REPORT PAIN IN THE STUMP, AND HOW SEVERE IS IT? (Surgeon)

| | <u>Amputee</u> | <u>Surgeon</u> |
|---|----------------|----------------|
| Walk or wear limb long time | 38% | |
| Weather | 25% | |
| Irritation, rash | 11% | |
| Most report some mild pain, but only during the early post-operative stage | | 35% |
| Rare in A/K stumps | | 20% |

WHAT IS WRONG WITH YOUR ARTIFICIAL LEG? (Amputee)

WHAT ARE THE AMPUTEE'S MAJOR COMPLAINTS WITH REFERENCE TO HIS LIMB?
(Surgeon)

| | <u>Amputee</u> | <u>Surgeon</u> |
|-----------------------------|----------------|----------------|
| Knee control | 25% | 10% |
| Improper fit | 17% | 20% |
| Excess weight | 17% | 15% |
| Improper alignment | 13% | |
| Stump pains and irritations | | 16% |

THEY COULD IMPROVE MY ARTIFICIAL LEG BY - - - (Amputee)

HOW DO YOU THINK ARTIFICIAL LIMBS COULD BE IMPROVED? (Surgeon)

| | <u>Amputee</u> | <u>Surgeon</u> |
|-----------------------------------|----------------|----------------|
| Better knee control | 33% | 19% |
| Reduction in weight | 22% | 22% |
| Better belt control | 11% | 10% |
| Eliminate noises | 10% | |
| Better maintenance service | 10% | |
| Use of suction socket | | 19% |
| More efficient fitting techniques | | 10% |

WHY DO OTHER AMPUTEES GET POORER USE OUT OF THEIR LEG THAN YOU DO?

(Amputee)

WHY DO YOU THINK SOME AMPUTEES GET BETTER USE FROM THEIR PROSTHESIS THAN OTHERS? (Surgeon)

| | <u>Amputee</u> | <u>Surgeon</u> |
|-----------------------|----------------|----------------|
| Psychological factors | 29% | 46% |
| Physiological factors | 22% | 20% |
| Fit | 20% | 9% |
| Age differences | | 9% |

WHAT DO YOU THINK OF THE LIMB YOU ARE PRESENTLY WEARING? (Amputee)

WHAT DO YOU THINK OF THE LIMBS USUALLY AVAILABLE TO A/K AMPUTEES? (Surgeon)

| | <u>Amputee</u> | <u>Surgeon</u> |
|-----------|----------------|----------------|
| Excellent | 4% | 5% |
| Good | 20% | 55% |
| Fair | 52% | 27% |
| Poor | 14% | 12% |
| Very poor | 10% | 1% |

WHAT DO YOU THINK OF THE LIMB-MAKER WHO FITTED YOUR LEG? (Amputee)

WHAT DO YOU THINK OF THE LIMB-MAKERS WORK? (Surgeon)

| | <u>Amputee</u> | <u>Surgeon</u> |
|-----------------------------------|----------------|----------------|
| Does a very competent job | 21% | 27% |
| Good job | 36% | 43% |
| Fair job | 38% | 26% |
| Doesn't know what he is doing | 2% | |
| Poor job | 3% | 2% |
| Are entirely unqualified for work | | 2% |

SECTION III - SURGEON - LIMB-MAKER --

WHAT DO YOU THINK OF THE LIMBS USUALLY AVAILABLE TO THE A/K AMPUTEE?

(Surgeon)

WHAT IS YOUR OPINION OF THE ARTIFICIAL LIMBS AVAILABLE TO THE AMPUTEE
TODAY? (Limb-Maker)

| | <u>Surgeon</u> | <u>Limb-Maker</u> |
|-----------|----------------|-------------------|
| Excellent | 5% | 7% |
| Good | 55% | 54% |
| Fair | 27% | 25% |
| Poor | 12% | 2% |
| Very poor | 1% | 2% |

WHAT ARE THE AMPUTEES' MAJOR COMPLAINTS CONCERNING THEIR LIMBS?

(Limb-Maker)

WHAT ARE THE AMPUTEE'S MAJOR COMPLAINTS WITH REFERENCE TO HIS LIMB?

(Surgeon)

| | <u>Surgeon</u> | <u>Limb-Maker</u> |
|----------------------------|----------------|-------------------|
| Improper fit | 20% | 18% |
| Stump pains and irritation | 16% | |
| Excess weight | 15% | 28% |
| Faulty knee mechanics | 10% | 10% |
| Bulky and cumbersome | 10% | |
| Noisy | | 6% |
| Improper alignment | | 6% |

HOW DO YOU THINK ARTIFICIAL LIMBS COULD BE IMPROVED (AS REGARDS DESIGN, FIT, ETC.) (Surgeon)

WHAT CHANGES CAN YOU SUGGEST FOR IMPROVING THE PRESENT ARTIFICIAL LEG?
(Limb-Maker)

| | <u>Surgeon</u> | <u>Limb-Maker</u> |
|---------------------------------------|----------------|-------------------|
| Decrease weight | 22% | 14% |
| Improvement of knee joint | 19% | 9% |
| Use of suction socket | 19% | |
| More efficient fitting techniques | 10% | |
| Less cumbersome harness | 10% | |
| More careful alignment | | 9% |
| More individualized, personal service | | 9% |

WHAT ARE THE ADVANTAGES OF CLOSE COOPERATION BETWEEN THE SURGEON AND LIMB-MAKER IN FITTING A PROSTHESIS? (Surgeon)

DO YOU FEEL THAT THE LIMB-MAKER SHOULD BE CONSULTED BY THE SURGEON PRIOR TO THE AMPUTATION? EXPLAIN. (Limb-Maker)

| | <u>Surgeon</u> | <u>Limb-Maker</u> |
|---|----------------|-------------------|
| Permits exchange of knowledge and skill | 38% | 34% |
| Surgeon can act as a check upon fit | 19% | 3% |
| Aid in adjusting the patient | 16% | 6% |
| Greater individual treatment and care | 15% | |

43% of the limb-makers advocate consultation only in some doubtful cases
14% consider consultation to be unnecessary.

WHAT CAN THE SURGEON DO TO SIMPLIFY THE FITTING PROBLEMS OF THE LIMB-MAKER? (Surgeon)

WHAT CAN THE ORTHOPEDIC SURGEON DO TO SIMPLIFY THE PROBLEM OF THE LIMB-MAKER? (Limb-Maker)

Surgeon

| | |
|--|-----|
| Close cooperation thru discussion and a mutual exchange of ideas | 42% |
| More efficient and complete healing and surgery | 37% |
| Prepare patient mentally | 10% |

Limb-Maker

| | |
|---|-----|
| More efficient type of surgery and post-operative healing | 33% |
| Acquire more knowledge concerning limbs and limb-fitting techniques | 21% |
| Cooperate and consult with the limb-maker | 15% |
| Consult limb-maker prior to amputation | 12% |

HOW IMPORTANT IN YOUR JUDGMENT IS TRAINING IN THE USE OF A PROSTHESIS?
(Surgeon)

HOW IMPORTANT IN YOUR JUDGMENT IS TRAINING FOR CORRECT USE OF THE LIMB?
(Limb-Maker)

| | <u>Surgeon</u> | <u>Limb-Maker</u> |
|------------------------------|----------------|-------------------|
| Of paramount importance | 81% | 84% |
| Not too important | 8% | |
| Important only in some cases | 4% | 4% |

WHY DO YOU THINK SOME AMPUTEES GET BETTER USE FROM THEIR PROSTHESIS THAN OTHERS? (Surgeon and Limb-Maker)

| | <u>Surgeon</u> | <u>Limb-Maker</u> |
|-------------------------------------|----------------|-------------------|
| Psychological factors | 46% | 43% |
| Physiological factors | 20% | 24% |
| More efficient fit | 9% | 18% |
| Training differences | 7% | 7% |
| Age differences (in favor of youth) | 9% | 2% |

WHAT DO YOU THINK OF THE LIMB-MAKERS' WORK? (Surgeon)

| | <u>Surgeon</u> |
|---|----------------|
| Does a very competent job | 27% |
| Does a good job | 43% |
| Does a fair job | 26% |
| Does a poor job | 4% |
| Are entirely unqualified for their work | 0% |

DO YOU THINK THAT MOST LIMB-MAKERS ARE QUALIFIED TO FIT A PROSTHETIC DEVICE? (Surgeon)

| | <u>Surgeon</u> |
|---|----------------|
| With no supervision | 12% |
| Under general supervision of the surgeon | 49% |
| Under detailed supervision of the surgeon | 39% |

SECTION IV - AMPUTEE - LIMB-MAKER - SURGEON --

WHAT IS WRONG WITH YOUR ARTIFICIAL LEG? (Amputee)

WHAT ARE THE AMPUTEE'S MAJOR COMPLAINTS WITH REFERENCE TO HIS LIMB?

(Surgeon)

WHAT DO YOU THINK ARE THE CHIEF FAULTS WHICH EXIST IN THE TYPES OF ARTIFICIAL LIMBS THAT ARE AVAILABLE TODAY (Socket, knee-joint, belt system, etc.)? (Limb-Maker)

| | <u>Amputee</u> | <u>Surgeon</u> | <u>Limb-Maker</u> |
|-----------------------------|----------------|----------------|-------------------|
| Knee control | 25% | 10% | 16% |
| Improper fit | 17% | 20% | 18% |
| Improper alignment | 13% | | 10% |
| Too heavy | 17% | 15% | 5% |
| Noise | 8% | | |
| Belt control | 6% | | 14% |
| Stump pains and irritations | | 16% | |
| Bulky | | 10% | |

WHY DO OTHER AMPUTEES GET BETTER USE OUT OF THEIR LEG THAN YOU DO? (Amputee)

WHY DO YOU THINK SOME AMPUTEES GET BETTER USE FROM THEIR PROSTHESIS THAN

OTHERS? (Surgeon)

WHY DO YOU THINK SOME AMPUTEES GET BETTER USE FROM THEIR PROSTHESIS THAN

OTHERS? (Limb-Maker)

| | <u>Amputee</u> | <u>Surgeon</u> | <u>Limb-Maker</u> |
|------------------------|----------------|----------------|-------------------|
| Psychological factors | 29% | 46% | 43% |
| Different physiology | 22% | 20% | 24% |
| Better fit | 20% | 9% | 18% |
| Practice | 10% | | |
| Instruction (training) | 11% | 7% | 7% |
| Age difference | | 9% | 6% |

THEY COULD IMPROVE MY ARTIFICIAL LEG BY - - - (Amputee)

HOW DO YOU THINK ARTIFICIAL LIMBS COULD BE IMPROVED (AS REGARDS DESIGN,
FIT, ETC.)? (Surgeon)

WHAT CHANGES CAN YOU SUGGEST FOR IMPROVING THE PRESENT ARTIFICIAL LEG?
(Limb-Maker)

| | <u>Amputee</u> | <u>Surgeon</u> | <u>Limb-Maker</u> |
|--|----------------|----------------|-------------------|
| Better knee | 40% | 19% | 9% |
| Better fit | 0% | 10% | 7% |
| Better alignment | 13% | | 9% |
| Less weight | 17% | 22% | 14% |
| Better foot joint | 15% | | |
| Better instruction | 6% | | |
| Better maintenance | 9% | | |
| Use of suction socket | | 19% | |
| Less bulky | | 10% | |
| More individualized personal service | | | 9% |
| Use of more lasting and pliable material alloy | | | 7% |
| Improvement in joint control | | | 7% |
| No changes | | | 7% |